SCRAMBLED CODE LETTERS FOR PROGRESS REPORT 48, PROJECT 1103-17
AUGUST 1, 1959

Company - Mill	Machine No.	Code Letter
The Chesapeake Corporation - West Point	1	--
Continental Can Company, Inc. - Hopewell	1	H
Gaylord Container Corporation - Bogalusa	4	--
International Paper Company		
Eastrop	1	E
Eastrop	2	--
Georgetown	1	F
Georgetown	2	--
The Mead Corporation		
Sylva	1	D
Lynchburg	2	--
Harriman	1	I
Muskingum Fibre Products Company - Coshocton	1	O
North Carolina Pulp Company - Plymouth	3	N
Olin Mathieson Chemical Corporation		
Monroe	1	--
Monroe	2	--
Owens-Illinois Glass Company		
Tomahawk	1	B
Tomahawk	2	A
Tomahawk	3	C
Big Island	1	K
Big Island	2	J
St. Joe Paper Company - Port St. Joe	1	--
Union Bag-Camp Paper Corporation		
Savannah	2	L
West Virginia Pulp and Paper Company		
Covington	6	M
Covington	7	--
Hindo and Dauch of Canada - Trenton	1	G
Charleston	--	--

THE INSTITUTE OF PAPER CHEMISTRY

Appleton, Wisconsin

SUPPLEMENTARY REPORT ON CALIPER OF SINGLE-FACED BOARD

Project 1108-17

Progress Report 48

to

FOURDRINIER KRAFT BOARD INSTITUTE, INC.

August 1, 1959

THE INSTITUTE OF PAPER CHEMISTRY

Appleton, Wisconsin

This report is supplementary to Progress Report 47 of the baseline study on corrugating medium which is entitled, "Continuous evaluation of corrugating medium" and provides a program whereby participation mills have the opportunity to submit rolls of medium on a regular weekly schedule for evaluation with regard to physical characteristics of the medium and of the single-faced board made from the medium. Specifically, each medium is evaluated for caliper, basis weight, and Concora flat crush. In addition each medium is fabricated into A-flute single-faced corrugated board on the Institute's corrugator to determine its runability in terms of speed and tension, and the single-faced board obtained at maximum speed with minimum tension is evaluated for its flat crush strength.

This report is an extension of the baseline study and is concerned specifically with the caliper and uniformity of caliper of the single-faced board fabricated from each roll of medium as described above. Uniformity of caliper is generally considered to be another facet of the criteria used to evaluate the runability of corrugating medium and the Technical Committee of the Fourdrinier Kraft Board Institute, Inc. has requested that a measurement of the uniformity of caliper be included as a part of the evaluation given each roll of corrugating medium.

The evaluation of the caliper and uniformity of caliper of the single-faced board made from each roll of corrugating medium was carried out by cutting five circular specimens, each with an area of ten

square inches, at intervals of approximately two feet along the central portion of a strip of the single-faced board fabricated at maximum speed and minimum tension. On each of these five specimens, caliper measurements were made on six consecutive flutes and the caliper difference between consecutive flutes was calculated, there being five calculations of differences for each specimen. The thirty caliper measurements (six calipers on each of the five specimens) were averaged and are reported as the caliper for each sample of medium. Likewise, the twenty-five caliper differences between consecutive flutes (five caliper differences on each of the five specimens) were averaged and are reported for each sample of corrugating medium as the caliper difference between consecutive flutes.

The instrument for measuring the caliper of individual flutes of single-faced board consists of a bench type thickness gage with a presser foot 1/2 inch long and 3/8 inch wide and an anvil consisting of a plane rectangular surface 1-1/2 inches wide and 3 inches long. The presser foot is attached to a dial indicator which can be read to 0.0001 inch. The load on the presser foot is 130 grams. In making a caliper determination, each ten-square-inch circular specimen is inserted between the presser foot and the anvil so that the foot rests on the third or fourth flute from one end of the specimen without touching either of the adjacent flutes. The 3/8-inch width of the presser foot permits it to contact only one flute with ease. The specimen is pressed gently against the anvil, and the reading is then recorded. As mentioned previously, six consecutive flutes through the center of each specimen are calipered in this way. It should be emphasized that these calipers may not

necessarily correspond to regular caliper measurements because of differences in load and other variables.

Caliper data have been obtained on the single-faced board fabricated from each of the 94 rolls of corrugating medium which were submitted for evaluation during the month of July. Also included for purposes of convenient reference are the single-face flat crush and runability data. The current machine averages for each test are summarized in Table I for Machines A through O. A graphical presentation of the caliper data on the single-faced board is shown in Figure 1, and a similar presentation of the data on the caliper difference between consecutive flutes is given in Figure 2. The test results obtained on the individual rolls of medium submitted by each company are given in Tables II through XVI for Machines A through O, respectively.

It may be seen in Figure 1 and Table I that the average caliper results for the single-faced boards varied from a low value of 195.1 points for Machine M to a high value of 197.1 points for Machine D. Likewise, from the results given in Table I and Figure 2, it may be noted that the average caliper difference between consecutive flutes ranged from a minimum of 1.2 points for Machine I to a maximum of 3.2 points for Machine O. The majority of the machines were associated with average caliper differences of approximately 2 points. The differences of 3.0 and 3.2 points associated with Machines N and O, respectively, would appear to be indicative of caliper nonuniformity greater than would usually be encountered.

TABLE I

SUMMARY OF CURRENT MACHINE AVERAGES
(July, 1959)

Machine	Number of Rolls	Caliper, points	Caliper Difference Between Consecutive Flutes, pt.	Single-Face Flat Crush, p.s.i.
A	8	195.6	2.0	35.5
B	8	195.7	1.6	34.5
C	6	196.2	1.6	36.6
D	4	197.1	1.6	32.6
E	8	195.3	2.4	38.4
F	7	195.6	1.8	37.5
G	8	196.6	1.7	32.5
H	7	195.7	1.8	36.8
I	2	195.2	1.2	29.9
J	6	196.1	1.8	34.2
K	6	195.8	1.6	34.3
L	8	196.6	1.6	34.7
M	8	195.1	2.0	32.5
N	1	196.4	3.0	39.0
O	7	196.4	3.2	33.3
Total	94			

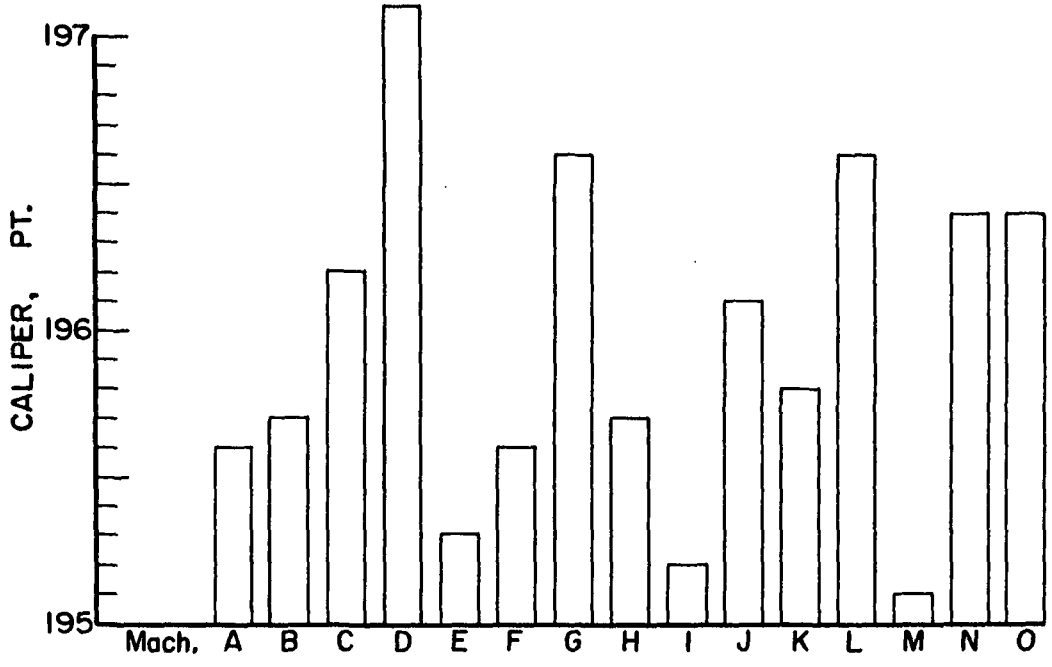

Figure 1

Comparison of Caliper Results on Single-Faced Board
July, 1959

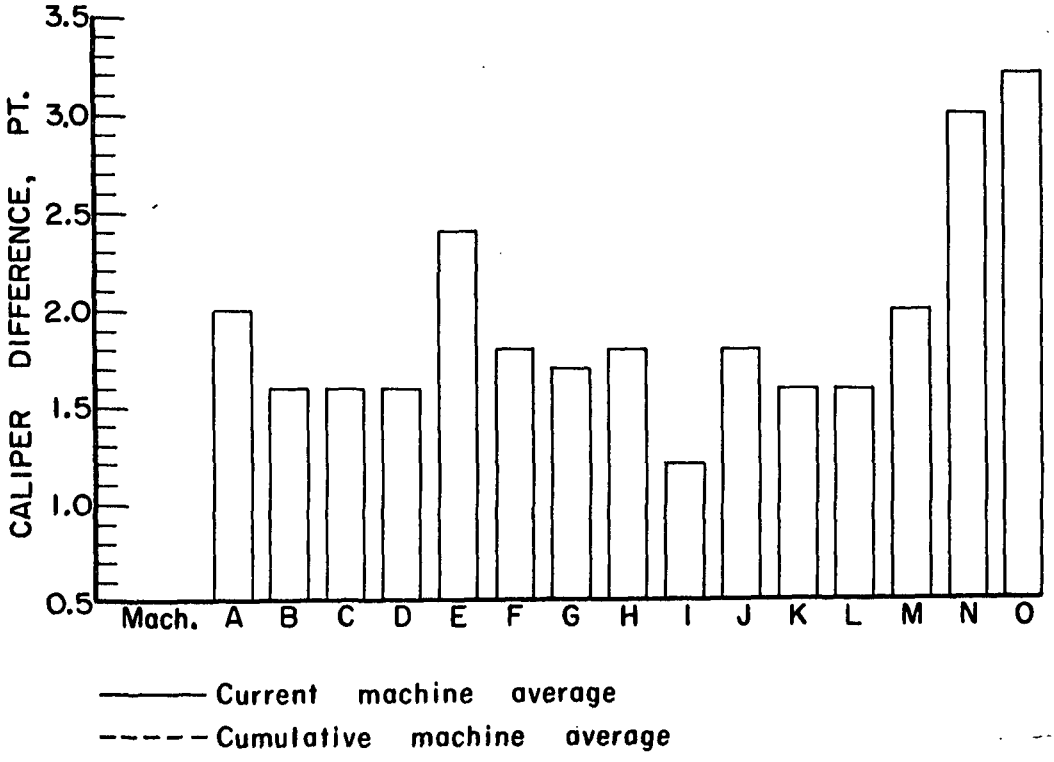

Figure 2

Comparison of the Caliper Differences Between Consecutive
Flutes of Single-Faced Board, July, 1959

TABLE II

SUMMARY OF TEST RESULTS FOR MACHINE A
July, 1959

Code	Date Made	Mill Roll No.	Caliper, pt.	Caliper Difference Between Consecutive Flutes, pt.	Single-Face Flat Crush, p.s.i.	Runability, Maximum Tension at 600 f.p.m., lb./in.
A-1	6-29-59	97	194.0	1.9	36.4	1/2
A-2	6-30-59	87	195.5	1.4	36.6	1-1/2
A-3	6-30-59	75	195.8	2.9	36.0	1-1/2
A-4	7- 7-59	1307	195.3	1.2	33.5	1/2
A-5	7- 9-59	1307	195.3	1.7	36.0	Note a
A-6	7-14-59	3A	195.9	2.1	36.0	min.
A-7	7-15-59	1	194.2	2.1	34.9	min.
A-8	7-16-59	3B	198.9	2.5	34.1	min.
Current Machine Average			195.6	2.0	35.5	

TABLE III

SUMMARY OF TEST RESULTS FOR MACHINE B
July, 1959

B-1	6-29-59	97	195.8	1.5	33.6	1-1/2
B-2	6-30-59	87	197.1	1.4	33.8	1-1/2
B-3	6-30-59	75	196.5	1.8	33.0	1-1/2
B-4	7- 7-59	1307	195.2	1.6	35.5	1/2
B-5	7- 9-59	1307	195.0	1.4	33.4	1/2
B-6	7-14-59	3A	195.6	1.4	34.2	min.
B-7	7-15-59	1	195.6	2.4	36.2	min.
B-8	7-16-59	3B	194.9	1.5	36.8	min.
Current Machine Average			195.7	1.6	34.5	

[a] Maximum speed at minimum tension for this roll was 500 f.p.m.

TABLE IV

SUMMARY OF TEST RESULTS FOR MACHINE C
July, 1959

Code	Date Made	Mill Roll No.	Caliper, pt.	Caliper Difference Between Consecutive Flutes, pt.	Single-Face Flat Crush, p.s.i.	Runability, Maximum Tension at 600 f.p.m., lb./in.
C-1	6-29-59	97	196.3	1.4	38.6	1-1/2
C-2	6-30-59	87	197.2	1.8	38.7	1-1/2
C-3	6-30-59	75	197.3	1.0	37.0	1
C-4	7-14-59	3A	196.1	1.9	34.2	min.
C-5	7-15-59	1	194.1	2.1	36.0	min.
C-6	7-16-59	3B	196.3	1.7	34.9	1/2
Current Machine Average			196.2	1.6	36.6	

TABLE V

SUMMARY OF TEST RESULTS FOR MACHINE D
July, 1959

D-1	6-24-59	159	197.8	1.9	30.9	1-1/2
D-2	6-24-59	160	197.1	0.9	34.5	1-1/2
D-3	7-16-59	165	195.4	1.5	31.4	1/2
D-4	7-16-59	166	198.1	1.9	33.4	1/2
Current Machine Average			197.1	1.6	32.6	

TABLE VI

SUMMARY OF TEST RESULTS FOR MACHINE E
July, 1959

Code	Date Made	Mill Roll No.	Caliper, pt.	Caliper Difference Between Consecutive Flutes, pt.	Single-Face Flat Crush, p.s.i.	Runability, Maximum Tension at 600 f.p.m., lb./in.
E-1	6-24-59	481	195.6	2.2	36.5	1-1/2
E-2	6-26-59	482	Note a	Note a	Note a	1-1/2
E-3	7- 1-59	483	196.0	2.4	38.3	1-1/2
E-4	7- 7-59	484	195.8	2.1	40.1	1-1/2
E-5	7-10-59	485	195.3	1.9	39.1	1-1/2
E-6	7-15-59	486	195.6	1.5	39.1	1-1/2
E-7	7-15-59	487	194.2	4.3	38.7	1-1/2
E-8	7-20-59	488	194.5	2.5	37.2	1-1/2
Current Machine Average			195.3	2.4	38.4	

TABLE VII

SUMMARY OF TEST RESULTS FOR MACHINE F
July, 1959

F-1	6-17-59	324	195.5	1.3	37.8	1-1/2
F-2	6-19-59	325	195.5	2.2	38.6	1
F-3	6-25-59	326	196.7	2.4	34.0	1-1/2
F-4	6-30-59	327	195.2	1.5	37.1	1-1/2
F-5	7- 2-59	328	195.5	1.0	39.8	1-1/2
F-6	7- 9-59	329	195.3	2.1	36.6	1-1/2
F-7	7- 9-59	330	195.7	2.0	38.8	1-1/2
Current Machine Average			195.6	1.8	37.5	

[a] Single-faced board for this sample was inadvertently destroyed before it could be tested.

TABLE VIII

SUMMARY OF TEST RESULTS FOR MACHINE G
July, 1959

Code	Date Made	Mill Roll No.	Caliper, pt.	Caliper Difference Between Consecutive Flutes, pt.	Single-Face Flat Crush, p.s.i.	Runability, Maximum Tension at 600 f.p.m., lb./in.
G-1	--	74	196.4	2.4	32.4	1-1/2
G-2	--	75	197.4	1.7	31.4	1-1/2
G-3	--	76	196.4	1.7	31.9	1-1/2
G-4	--	77	197.0	2.0	30.8	1-1/2
G-5	--	78	195.8	1.8	34.2	1
G-6	--	79	196.1	1.0	33.6	1-1/2
G-7	--	80	197.0	1.2	33.0	1-1/2
G-8	--	81	196.5	1.5	32.9	1-1/2
Current Machine Average			196.6	1.7	32.5	

TABLE IX

SUMMARY OF TEST RESULTS FOR MACHINE H

H-1	6-16-59	182	195.4	1.8	38.3	1-1/2
H-2	6-18-59	183	195.9	1.8	39.4	1-1/2
H-3	6-19-59	184	195.7	1.7	36.2	1-1/2
H-4	7- 1-59	185	195.8	1.5	36.9	1-1/2
H-5	7- 2-59	186	195.3	1.5	34.8	1-1/2
H-6	7- 7-59	187	195.6	2.1	35.1	1-1/2
H-7	7- 8-59	188	196.1	2.2	36.6	1-1/2
Current Machine Average			195.7	1.8	36.8	

TABLE X

SUMMARY OF TEST RESULTS FOR MACHINE I
July, 1959

Code	Date Made	Mill Roll No.	Caliper, pt.	Caliper Difference Between Consecutive Flutes, pt.	Single-Face Flat Crush, p.s.i.	Runability Maximum Tension at 600 f.p.m., lb./in.
I-1	7- 2-59	161	196.6	1.3	30.4	1
I-2	7- 2-59	162	193.8	1.2	29.5	1/2
Current Machine Average			195.2	1.2	29.9	

TABLE XI

SUMMARY OF TEST RESULTS FOR MACHINE J
July, 1959

J-1	6- 3-59	244	196.5	2.1	34.6	1
J-2	6- 5-59	410	196.3	1.9	33.1	1-1/2
J-3	6- 8-59	609	195.7	1.9	35.6	1-1/2
J-4	6-10-59	740	196.0	1.4	33.6	1-1/2
J-5	6-25-59	1877	196.6	1.5	35.0	1-1/2
J-6	6-28-59	2029	195.5	1.9	33.3	1-1/2
Current Machine Average			196.1	1.8	34.2	

TABLE XII

SUMMARY OF TEST RESULTS FOR MACHINE K
July, 1959

K-1	6- 3-59	184	195.8	1.9	31.1	1/2
K-2	6- 9-59	675	195.5	1.9	35.8	1-1/2
K-3	6-13-59	1014	195.6	1.5	36.6	1-1/2
K-4	6-18-59	1260	195.7	2.0	34.6	1-1/2
K-5	6-22-59	1514	195.5	1.1	32.3	1-1/2
K-6	6-29-59	1226	196.5	1.1	35.2	1-1/2
Current Machine Average			195.8	1.6	34.3	

TABLE XIII

SUMMARY OF TEST RESULTS FOR MACHINE L
July, 1959

Code	Date Made	Mill Roll No.	Caliper, pt.	Caliper Difference Between Consecutive Flutes, pt.	Single-Face Flat Crush, p.s.i.	Runability, Maximum Tension at 600 f.p.m., lb./in.
L-1	6-11-59	292	196.2	1.3	34.0	1-1/2
L-2	6-13-59	293	195.2	1.8	34.9	1-1/2
L-3	6-15-59	294	195.8	2.2	33.8	1-1/2
L-4	6-25-59	295	196.8	1.2	32.5	1-1/2
L-5	6-28-59	296	197.3	1.5	35.6	1-1/2
L-6	7- 1-59	297	196.7	2.3	36.7	1-1/2
L-7	7- 9-59	298	197.1	1.0	34.6	1-1/2
L-8	7- 9-59	299	197.6	1.3	35.8	1-1/2
Current Machine Average			196.6	1.6	34.7	

TABLE XIV

SUMMARY OF TEST RESULTS FOR MACHINE M
July, 1959

M-1	5-23-59	13	194.1	1.9	30.9	1/2
M-2	5-25-59	14	194.6	2.7	30.2	1/2
M-3	5-28-59	15	195.4	2.0	34.4	1-1/2
M-4	6- 1-59	16	194.6	1.9	33.2	1-1/2
M-5	6- 4-59	17	194.8	1.5	32.6	1-1/2
M-6	6- 8-59	18	195.2	2.5	31.6	1-1/2
M-7	6-11-59	19	195.6	2.0	33.6	1-1/2
M-8	6-22-59	20	196.2	1.8	33.7	1
Current Machine Average			195.1	2.0	32.5	

TABLE XV

SUMMARY OF TEST RESULTS FOR MACHINE N
July, 1959

Code	Date Made	Mill Roll No.	Caliper, pt.	Caliper Difference Between Consecutive Flutes, pt.	Single-Face Flat Crush, p.s.i.	Runability Maximum Tension at 600 f.p.m., lb./in.
N-1	6-24-59	706	196.4	3.0	39.0	Note a
Current Machine Average			196.4	3.0	39.0	

TABLE XVI

SUMMARY OF TEST RESULTS FOR MACHINE O
July, 1959

O-1	6-18-59	251	196.0	3.6	32.0	1
O-2	6-20-59	252	194.6	4.6	32.5	1-1/2
O-3	6-27-59	253	199.4	2.0	30.2	1-1/2
O-4	7- 2-59	254	195.9	2.9	34.3	1
O-5	6-23-59	255	197.1	2.5	30.9	1-1/2
O-6	7- 8-59	256	195.9	3.8	37.0	1-1/2
O-7	7- 8-59	257	196.0	3.1	36.3	1-1/2
Current Machine Average			196.4	3.2	33.3	

[a] Maximum speed with minimum tension for this roll was 575 f.p.m.

THE INSTITUTE OF PAPER CHEMISTRY

W. N. Hubert

W. N. Hubert, Research Aide
Container Section

R C McKee

R. C. McKee, Chief, Container Section